planes detected by Electron backscatter diffraction; and

the semiconductor film contains less than 5 x 10^{18} nitrogen atoms per cm^3, less than 5 x 10^{18} carbon atoms per cm^3, and less than 1 x 10^{19} oxygen atoms per cm^3.

[Claim 3]

A semiconductor film having a crystal structure with the composition ratio of germanium to silicon being 0.1 atomic percent or more and 10 atomic percent or below, characterized in that

the {101} plane in the semiconductor film reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction; and

being obtained by crystallizing an amorphous semiconductor film formed by intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or below.

[Claim 4]

A semiconductor film having a crystal structure with the composition ratio of germanium to silicon being 0.1 atomic percent or more and 10 atomic percent or below, characterized in that

the {101} plane in the semiconductor film reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction;

containing less than 5 x 10^{18} nitrogen atoms per cm^3, less than 5 x 10^{18} carbon atoms per cm^3, and less than 1 x 10^{19} oxygen atoms per cm^3; and

being obtained by crystallizing an amorphous semiconductor film formed by intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or below.

[Claim 5]

A semiconductor film according to any one of claims 1 to 4, wherein the

thickness of the semiconductor film is 10 nm through 100 nm.

[Claim 6]

A semiconductor device, wherein:

a channel formation region is formed from a semiconductor film and the semiconductor film has a crystal structure with a composition ratio of germanium to silicon being 0.1 atomic percent to 10 atomic percent or below; and

the {101} plane in the semiconductor film having a crystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 7]

A semiconductor device, wherein:

a channel formation region is formed from a semiconductor film and the semiconductor film has a crystal structure with the composition ratio of germanium to silicon being 0.1 atomic percent or more and 10 atomic percent or below; and

the {101} plane in the semiconductor film reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction; and the semiconductor film contains less than 5×10^{18} nitrogen atoms per cm^3, less than 5×10^{18} carbon atoms per cm^3, and less than 1×10^{19} oxygen atoms per cm^3.

[Claim 8]

A semiconductor device, wherein:

a channel formation region is formed from a semiconductor film and the semiconductor film has a crystal structure with the composition ratio of germanium to silicon being 0.1 atomic percent or more and 10 atomic percent or below;

the {101} plane in the semiconductor film reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction; and

the semiconductor film is obtained by crystallizing an amorphous semiconductor

film formed by intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or below.

[Claim 9]

A semiconductor device, wherein:

a channel formation region is formed from a semiconductor film and the semiconductor film has a crystal structure with the composition ratio of germanium to silicon being 0.1 atomic percent or more and 10 atomic percent or below;

the {101} plane in the semiconductor film reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction;

the semiconductor film contains less than 5×10^{18} nitrogen atoms per cm^3, less than 5×10^{18} carbon atoms per cm^3, and less than 1×10^{19} oxygen atoms per cm^3; and

the semiconductor film is obtained by crystallizing an amorphous semiconductor film formed by intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or below.

[Claim 10]

A semiconductor device according to any one of claims 6 to 9, wherein the thickness of the semiconductor film is 10 nm through 100 nm.

[Claim 11]

A method of manufacturing a semiconductor device comprising of:

a first step of forming an amorphous semiconductor film by plasma CVD through intermittent electric discharge, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or below to silicon; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film

to heat treatment to form a semiconductor film having a crystal structure,

wherein the {101} plane in the semiconductor film having a crystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 12]

A method of manufacturing a semiconductor device comprising:

a first step of forming an amorphous semiconductor film by plasma CVD through intermittent electric discharge, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or below to silicon, the amorphous semiconductor film containing less than 5×10^{18} nitrogen atoms per cm^3, less than 5×10^{18} carbon atoms per cm^3, and less than 1×10^{19} oxygen atoms per cm^3; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film to heat treatment to form a semiconductor film having a crystal structure,

wherein the {101} plane in the semiconductor film having the crystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 13]

A method of manufacturing a semiconductor device comprising f:

a first step of forming an amorphous semiconductor film by plasma CVD through intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or less, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or below to silicon; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film

to heat treatment to form a semiconductor film having a polycrystal structure,

wherein the {101} plane in the semiconductor film having a crystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 14]

A method of manufacturing a semiconductor device comprising:

a first step of forming an amorphous semiconductor film by plasma CVD through intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or less, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or less to silicon, the amorphous semiconductor film containing less than 5×10^{18} nitrogen atoms per cm^3, less than 5×10^{18} carbon atoms per cm^3, and less than 1×10^{19} oxygen atoms per cm^3; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film to heat treatment to form a semiconductor film having a crystal structure,

wherein the {101} plane in the semiconductor film having a polycrystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 15]

A method of manufacturing a semiconductor device according to any one of claims 11 to 14, wherein the thickness of the amorphous semiconductor film is 10 nm through 100 nm.

[Claim 16]

A method of manufacturing a semiconductor device comprising:

a first step of forming an amorphous semiconductor film by plasma CVD

through intermittent electric discharge, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or below to silicon; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film to heat treatment to form a semiconductor film having a crystal structure,

wherein a channel formation region is formed form the semiconductor film having the crystal structure, and

wherein the {101} plane in the semiconductor film having the crystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 17]

A method of manufacturing a semiconductor device comprising f:

a first step of forming an amorphous semiconductor film by plasma CVD through intermittent electric discharge, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or below to silicon, the amorphous semiconductor film containing less than 5×10^{18} nitrogen atoms per cm^3, less than 5×10^{18} carbon atoms per cm^3, and less than 1×10^{19} oxygen atoms per cm^3; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film to heat treatment to form a semiconductor film having a crystal structure,

wherein a channel formation region is formed form the semiconductor film having the crystal structure, and

wherein the {101} plane in the semiconductor film having the crystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 18]

A method of manufacturing a semiconductor device comprising:

a first step of forming an amorphous semiconductor film by plasma CVD through intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or less, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or below to silicon; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film to heat treatment to form a semiconductor film having a crystal structure,

wherein a channel formation region is formed form the semiconductor film having the crystal structure, and

wherein the {101} plane in the semiconductor film having the crystal structure reaches 30% or more of all the lattice planes detected by Electron backscatter diffraction.

[Claim 19]

A method of manufacturing a semiconductor device comprising:

a first step of forming an amorphous semiconductor film by plasma CVD through intermittent electric discharge while setting the repetition frequency to 10 kHz or below and the duty ratio to 50% or less, the amorphous semiconductor film containing germanium with a composition ratio of 0.1 atomic percent or more and 10 atomic percent or less to silicon, the amorphous semiconductor film containing less than 5×10^{18} nitrogen atoms per cm^3, less than 5×10^{18} carbon atoms per cm^3, and less than 1×10^{19} oxygen atoms per cm^3; and

a second step of doping the amorphous semiconductor film with an element for promoting crystallization of the amorphous semiconductor film, and then subjecting the film